UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

IN RE: REMBRANDT TECHNOLOGIES, LP PATENT LITIGATION	MDL Docket No. 07-md-1848 (GMS)

DEFENDANTS' OPENING CLAIM CONSTRUCTION
BRIEF CONCERNING U.S. PATENT NO. 5,243,627

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Rembrandt	Rembrandt Technologies, LP, and Rembrandt Technologies, LLC d/b/a Remstream
Defendants (All Other Parties)	Charter Communications, Inc., Charter Communications Operating, LLC, Comcast Corporation, Comcast Cable Communications, LLC, Century-TCI California Communications, LP, Century-TCI Holdings, LLC; Comcast of Florida/Pennsylvania, LP (f/k/a Parnassos, LP), Comcast of Pennsylvania II, LP (f/k/a/ Century-TCI California, LP), Parnassos Communications, LP, Parnassos Holdings, LLC; Comcast Cable Communications Holdings, Inc, CoxCom, Inc., Time Warner Cable Inc., Time Warner Cable LLC, Time Warner NY Cable LLC, Time Warner Entertainment Company, L.P., Time Warner Entertainment-Advance/Newhouse Partnership, NY Cablevision, LP., Western NY Cablevision, LP, Cablevision Systems Corporation, CSC Holdings, Inc., CBS Corporation, NBC Universal, Inc., ABC, Inc., Fox Broadcasting Company, Fox Entertainment Group Inc., Sharp Corp., and Sharp Electronics Corp.
’627	U.S. Patent No. 5,243,627
’625	U.S. Patent No. 4,677,625
Wei Paper	L. Wei, “Trellis-Coded Modulation with Multidimensional Constellations,” *IEEE Trans. on Comm’cn Theory*, Vol. IT-33, No. 4 at 483-501, July 1987.
I	The axis of a constellation representing the amplitude of the in-phase, or cosine, component of an analog signal.
Q	The axis of a constellation representing the amplitude of the quadrature-phase, or sine, component of an analog signal.
QAM	Quadrature Amplitude Modulation
2D	Two-dimensional
4D	Four-dimensional
AT&T	American Telephone & Telegraph Co.
ATSC	Advanced Television Systems Committee

TABLE OF CITATION FORMATS

__:__	Column and line number citation to ’627 unless another patent is indicated.
A___	Pages relied on by both sides in the Joint Appendix of Intrinsic and Extrinsic Evidence.
D___	Pages relied on by Defendants in the Joint Appendix of Intrinsic and Extrinsic Evidence.
G ¶__	Paragraph citation to June 4, 2008 Declaration of Richard Gitlin.

I. PRELIMINARY STATEMENT

The ’627 patent issued nearly 15 years ago, and in that period none of its previous owners, AT&T, Lucent and Paradyne, ever asserted it against anyone who performed the 12-year old ATSC standard. Rembrandt now attempts to make gold out of straw by reinterpreting the ’627 to try to cover a major industry standard a dozen years after the fact.

The ’627 relates to a particular way to transmit data so that it is less susceptible to errors caused by “noise bursts” on a communications path. Through well-known error correction techniques, such as “trellis encoding,” a receiver can recreate disrupted information using the pattern of the previous signals. Another technique, known as interleaving, spreads out data before transmission. Deinterleaving restores the data received by the receiver to its original order. Interleaving and deinterleaving improve the likelihood of correcting errors in data that have been encoded by the trellis encoding technique.

An analogy to voice communication may be helpful. If a single loud noise drowns out five consecutive words of a sentence, it may be impossible to infer the meaning of those words. On the other hand, if noise is spread out, never affecting consecutive words, it is likely easier to infer the missing words, or at least their meaning, from the context of the surviving words. With human communication it is not possible to shuffle the order of words so as to prevent a burst of noise from affecting consecutive words that the listener is trying to understand. But in data transmissions, such shuffling (interleaving) is both possible and common.

As the ’627 itself explains, both of these techniques are described by named inventor Betts in his own prior art U.S. Patent 4,677,625. The ’625 interleaves trellis encoded channel symbols, which are discretely generated units of data (each the product of one trellis “expansion”) used to transmit information. The ’625 describes interleaving symbols so that otherwise adjacent symbols will not be adjacent during transmission when they may be exposed

to noise. This mitigates the effects of noise bursts. Symbols that survive a noise burst can then more easily be used to recover the symbols disrupted by the noise.

The ’627 is similar to the Betts ’625, but has an additional layer of interleaving. A key difference between the two patents is that the symbols in the ’627 have more than one constituent part, each such part known as a “signal point.” Symbols made up of multiple signal points are known in the art as “multidimensional symbols.” Whereas the ’625 only interleaves at the symbol (word) level using multiple trellis encoders, the ’627 also interleaves the multiple “signal points” of each multidimensional symbol. To return to the word analogy, the second level of interleaving of the ’627 is akin to interleaving the syllables within words so as to reduce the likelihood that two syllables in a row are lost to noise, thereby improving the chance of decoding the message.

The ’627 explains that the “enhanced” performance it claims is due to the “signal point interleaving technique which causes the constituent signal points of the channel symbol to be non-adjacent as they traverse the channel.” (2:8, 2:11-13.)[1] Thus, the claimed novelty of the ’627 is interleaving the constituent “signal points” of each “trellis encoded channel symbol” so that they are no longer adjacent to each other. (1:8-15; 2:5-13; 5:1-5.) Because one cannot interleave a single signal point to obtain that result, the ’627 is only applicable to multidimensional symbol systems (i.e., systems in which each trellis-encoded channel symbol has two or more signal points.) Rembrandt cannot deny, and has not denied, this requirement.

The ATSC standard that Rembrandt is attempting to cover with its claim construction involves only the use of one-dimensional symbols that do not have multiple signal points.

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[1] Citations appearing as “__:__” refer to the columns and lines of the ’627 unless a different patent is indicated. The ’627 starts at page A001 of the Joint Appendix of Intrinsic and Extrinsic Evidence.

Consequently, Rembrandt seeks an ambiguous construction of the term "trellis encoded channel symbol . . . comprised of a plurality of signal points" so it can contend that a series of single-dimensional symbols that are separately encoded are a single trellis encoded channel symbol.[2] Such a construction ignores that a trellis encoded channel symbol is characterized by a single expansion of a set of parallel bits into a larger set of bits that will be used for the selection of constituent signal points. (*See, e.g.*, 3:65-68.) Rembrandt's definition is not tethered to the single "expansion" operation of a trellis encoder, and will be argued to sweep in signal points that are actually separate symbols. It ignores that a channel symbol consists of signal points that have been encoded, and will be decoded, together. Rembrandt's proposal is inconsistent with the purpose of the signal point interleaving function, which is to improve decoding performance by interleaving signal points from a channel symbol that will later be decoded together. (*See, e.g.*, 6:12-20.)

For these and other reasons set forth below, the Defendants' proposed constructions should be adopted.

II. OVERVIEW OF THE '627

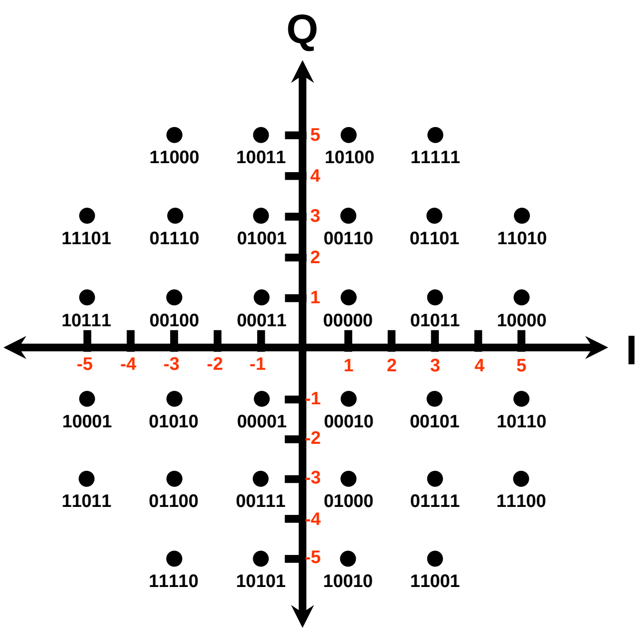
A. Basic Transmission of Signals: converting digital bits to analog signals

"Digital" information refers to information represented as binary "bits" (ones or zeros). Most communication channels do not convey information in digital form. Instead, they carry analog electrical signals that "traverse the channel" (2:13) as waveforms. To transmit digital

[2] Defendants refer to the accused standard to provide context to the disputes, not to ask this Court to construe the claims based on the accused standard. "[A] trial court may consult the accused device [or standard] for context that informs the claim construction process." *Serio-US Industries, Inc. v. Plastic Recovery Technologies Corp.*, 459 F.3d 1311, 1319 (Fed. Cir. 2006); *see also Wilson Sporting Goods Co. v. Hillerich & Bradsby Co.*, 442 F.3d 1322, 1326-27 (Fed. Cir. 2006) ("knowledge of that [accused] product or process provides meaningful context for the first step of the infringement analysis, claim construction.").

information from a transmitter to a receiver over an analog channel therefore requires that the information be converted into a series of waveforms by a process called modulation that takes advantage of the fact that each waveform has physical properties that can be used to represent digital information. (D002-3 at G ¶¶3-4.)[3]

The characteristics of a particular analog signal can be represented as a point, called a "signal point," on a two dimensional graph having "I" as one axis and "Q" as the other, as shown



on the left.[4] Each signal point can be assigned a block of bits. (D003 at G ¶5.) For example, the block of bits 00000 may correspond to a unique signal point (and discrete point on the graph), the block of bits 11011 may correspond to another signal point (and discrete point), and so on. A 2-dimensional constellation depicts the relationship between individual blocks of bits and their corresponding signal points. ('627 Fig. 2 depicts this same constellation, but without their corresponding bit values.) To transmit a block of bits requires converting it into signal point values (e.g., "I and Q" values indicated by the hashmarks in the figure) (5:55) and then using a modulator to create the waveform corresponding to the signal point as in the following example: 00000 → constellation point (1, 1) → . (D003-4 at G ¶6.) The

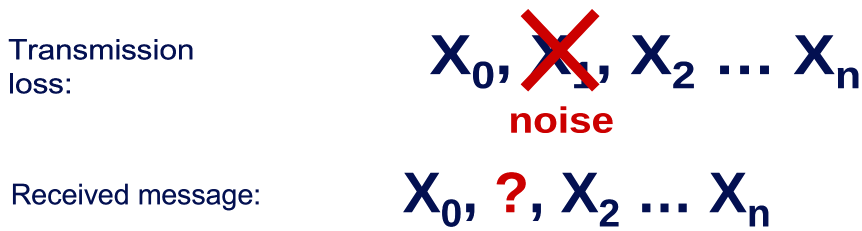
[3] Citations appearing as "D___" refer to pages in the Joint Appendix of Intrinsic and Extrinsic Evidence. Citations appearing as G ¶__ refer to paragraphs in the Declaration of Richard Gitlin.

[4] "I" is the amplitude of the cosine component and "Q" is the amplitude of the sine component of the waveform. (See 3:35-38; 5:53-56.)

receiver knows that different waveforms represent different blocks of bits.[5] It determines the transmitted message by converting each waveform back into the appropriate bits.

B. Trellis Encoding: reducing transmission errors

Noise can cause transmission errors. A transmitter may send a series of signals, including, say, the signal X_1 having the signal point coordinates (1, 1), but noise could alter the characteristics of the waveform causing the receiver to measure it as (2, 1). Because (2, 1) is not a point on our example constellation (there is no "•" at those hashmarks), the receiver does not know which of the nearest signal points--(3, 1) or (1, 1)--was transmitted (5:48-64; D004 at G ¶7), and might decode the X_1 signal into the wrong block of bits.



To reduce the error rate, digital signaling often uses error correction codes. One such coding scheme is trellis encoding, which addresses this problem by "expand[ing]" a group of bits–i.e., adding an extra bit to each block of digital information being transmitted in each signal. (3:20-22; D005-10 at G ¶¶9-19.) This extra bit helps the receiver more accurately determine the data actually sent. The trellis encoder imposes constraints on the sequence of transmitted signals which can then be used by the receiver's decoder. If noise disturbs the transmission, the decoder can resolve which signal point was transmitted based on the allowable sequence of received signal points, i.e., the signal point and surrounding sequence must follow the trellis constraints. For example, if the signal point (1, 1) is received as (2, 1), the receiver may be able to determine

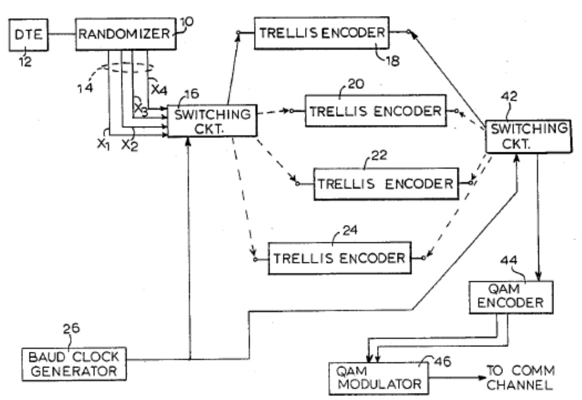
[5] "Receiver" refers to the "receiving section of a modem" and "transmitter" refers to the "transmitting section of a modem." (2:36-42; 5:48-49; 9:46.)

that the correct value is (1, 1) because (2, 1) is not one of the signal points in an allowed sequence.

Receiver recovers missing signal point from received signal points: $X_0, X_1, X_2 \ldots X_n$

C. The ’625 Prior Art Patent Addresses the Problem of Correlated Noise

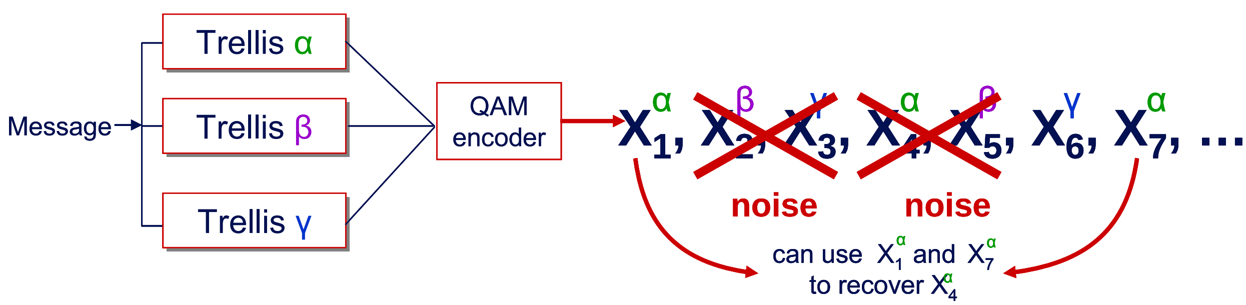
The ’627 explains that noise can be “highly correlated,” and so interfere with several trellis encoded channel symbols that follow each other in the transmission channel (a “trellis encoded channel symbol” contains one or more signal points all selected with one group of bits input to a trellis encoder, as explained further in Section II.D.3). (1:41-58.) If correlated noise affects several adjacent symbols in the channel, it makes it difficult to recover the data



those symbols represent, even using the trellis constraints. The prior art, such as the ’625 patent shown on the left, “addresses this issue [of correlated noise] by distributing the outgoing data to a plurality of trellis encoders in round-robin fashion and interleaving the trellis encoder outputs on the transmission channel.” (1:59-62; *see also* D099 (’625, Fig. 1); D013-14 at G ¶¶25-26.) Thus, instead of using one trellis encoder, several are used so that trellis encoded channel symbols selected using consecutive outputs from the same trellis encoder “are separated from one another” “as they traverse the channel” by symbols selected using other trellis encoders. (1:65-68.) This is done because the consecutive symbols selected using the same trellis encoder must form an allowable signal sequence, but symbols selected using different trellis encoders are not so related. A burst of correlated noise that affects many adjacent symbols during transmission will now affect fewer symbols selected using any

one trellis encoder. "In the receiver, the stream of received interleaved channel symbols is correspondingly distributed to a plurality of trellis decoders." (1:62-65.) This reduces "the correlation of the noise . . . from what it would have otherwise been." (1:67-2:2.)

For example, one could use three trellis encoders labeled α, β, γ (as shown in '627 Figure 3) to encode a series of symbols "in round-robin." The symbols in this example each contain only one signal point. Symbols from the "α" trellis encoder would be related to each other but not to the symbols from the other trellis encoders. In the figure below, symbols X_1^α, X_4^α and X_7^α are the first, fourth and seventh symbols on the channel, but are sequential outputs of trellis encoder α and adjacent to one another prior to the symbol interleaving that combines them into one stream. Now, a burst of noise that interferes with four consecutive symbols during transmission may only interfere with X_4^α (as well as three symbols from other encoders) leaving X_1^α and X_7^α intact. After deinterleaving in the receiver, the X_4^α symbol could be recovered with an estimate based on symbols X_1^α and X_7^α because they are all from the same "α" trellis encoder and constitute an allowable sequence.



D. The '627 Patent

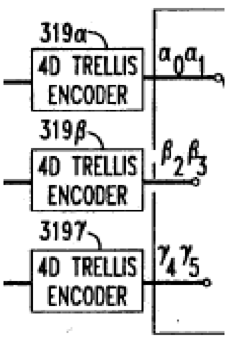
1. The '627 Purportedly Improves On The '625

The '627 is a purported "enhance[ment]" to the '625 channel symbol interleaving technique. (2:5-8.) The '627 is the "combination" of the '625 with a purportedly new "signal point interleaving technique which causes the constituent signal points of the channel symbols to

be non-adjacent as they traverse the channel." (2:5-13.) To combat the effects of correlated noise, the invention not only separates consecutive symbols as in the '625, but also separates, in systems using symbols having more than one signal point, the "constituent signal points" of each symbol so that they are also "non-adjacent as they traverse the channel."

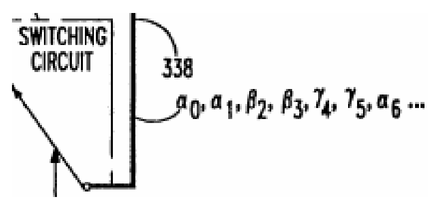
2. Interleaving Both Symbols and Signal Points

As explained above, the '627 uses the distributed trellis encoding and symbol interleaving technique of the '625. (5:1-4.) The '627 describes performing the prior art technique of symbol interleaving before interleaving the signal points. In the disclosed



embodiment, three trellis encoders **319** (α, β, γ), shown on the left from '627 Figure 3, generate three separate streams of trellis encoded subset identifier pairs. (5:1-47; Fig. 3.)[6] Each pair is used to identify the two different signal points that constitute one symbol. Trellis encoder-α generates the subset identifier pair α_0 α_1 and the β and γ trellis encoders generate their respective subset identifier pairs. (5:5-17; Fig. 3.)

Switch **337** with lead **338**, from Figure 3, shown below, combines these three streams into one "stream of subset identifiers . . . α_0, α_1, β_2, β_3, γ_4, γ_5, α_6, ..." (5:17-24.) The QAM encoder, shown elsewhere in the same Figure 3, receives each pair of



subset identifiers and, with additional bits (representing an index value),[7] generates a symbol containing two signal points. (5:17-22.) The QAM encoder **324** generates a sequence of

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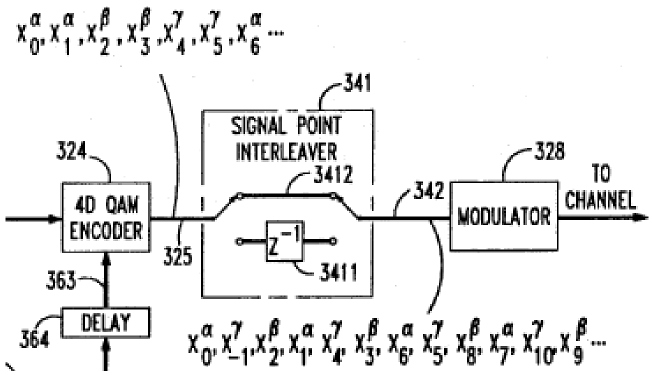
[6] A "subset identifier" is a group of bits that identify one subset of signal points in a constellation. (3:65-68.) The '627 "divide[s]" the "32 signal points" of its 2D constellation "into four subsets, A through D, each comprised of eight signal points." (3:8-11.)

[7] Index values are used to "select[] a particular signal point from [a] subset . . . ." (3:30-31.)

symbols in which each symbol's signal points are adjacent: "X_0^α, X_1^α, X_2^β, X_3^β, X_4^γ, X_5^γ, X_6^α . . . ." (5:25-26.) This sequence corresponds to what would be transmitted using the '625 method. (6:52-55; Fig. 5, II.)[8]

The '627 then proceeds with signal point interleaving. The sequence of symbols just described as coming from QAM encoder **324** (see below) is then "supplied, in accordance with the invention, to signal point interleaver **341** . . . ." (5:30-32.) The signal point interleaver **341** shuffles this sequence to produce an "interleaved stream of trellis encoded signal points [which] is X_0^α, X_{-1}^γ, X_2^β, X_1^α, X_4^γ, X_3^β, X_6^α, X_5^γ . . . ." (5:37-39.) The signal point interleaver thereby further imposes "non-adjacency" between "the signal points which belong to any particular channel symbol . . . ." (7:58-60.) The modulator **328** then generates a "line signal" with a waveform corresponding to each signal point. The receiver demodulates the waveform, deinterleaves the received signal points, and then decodes them. (5:48-6:45.)



3. The '627 Only Uses Symbols That Have ">1" Signal Points

Explicit in the claims and implicit in the above discussion is that each channel symbol has more than one signal point. The '627 makes repeated reference to "2N-dimensional channel symbols" where N>1. (3:52; 4:54-55; 8:18-19; 8:22-23; 9:14-15.) The "2" refers to a 2-dimensional signal point constellation (having the I and Q axes described above), while the "N"

[8] The "X" here denotes a signal point, not a symbol; the Greek letter superscripts denote which trellis encoder the signal point came from and the Arabic numeral subscripts denote their original order before signal point interleaving. "X_0^α, X_1^α" is one 4D symbol, "X_2^β, X_3^β" is another 4D symbol, etc.

refers to the number of signal points that make up the symbol. (3:4-9; 3:56-58; 8:61-64.) When "N=1," a "two-dimensional signaling scheme" is used (3:19-20; Fig. 2) whereby a symbol is a single signal point on a 2-dimensional signal constellation.

The '627 invention, however, is predicated on the use of "2N-dimensional channel symbols," where "N>1" (3:52; 4:54-55; 8:18-19; 8:22-23; 9:14-15), meaning each symbol is composed of at least two 2D signal points. For example, when N=2, the resulting 2 x 2-dimensional signaling scheme is also known as "four-dimensional . . . (i.e. N=2)" because it consists of 2 signal points each chosen from a 2-dimensional constellation. (3:62-63.) Generating a trellis encoded symbol having more than one signal point is similar to generating a symbol having only one signal point except that, in the case of N=2, a group of "parallel bits . . . are expanded . . . to identify a pair of subsets . . . ." (3:65-68; emphasis added.) In other words, a key difference between two successive symbols, each with one 2D signal point and a single 4D symbol composed of two 2D signal points, is that the former is merely the result of *two* expansions by a trellis encoder, one for each signal point, whereas the latter is the result of *one* expansion that generates the pair of related signal points. (D011 at G ¶¶ 20-22.)

Having only one trellis expansion for an N>1 symbol is advantageous because it "reduces the number of redundant" or expansion bits so that only 1 bit is needed for an entire symbol, instead of 1 bit for *each* signal point. (D042 (p. 490.)) The '627 does not show *how* a trellis encoder generates symbols having more than one signal point, but this was well-known at the time. (D012 at G ¶ 23.) For example, the '627 cites a paper by Lee-Fang Wei (4:48-51) ("Wei Paper") discussing trellis encoding to form symbols with multiple signal points. (D035-53.) In the Wei Paper (D045), one expansion of parallel input bits generates a pair of subset identifiers which are used to identify a pair of 2D signal points, i.e. *one* 4D symbol. (D011 at G¶22; *see*

also 3:65-68; 4:54-56.) Thus the prior art confirms that a multi-signal point trellis encoder takes one group of parallel input bits and performs a single expansion to make one multi-signal point symbol.

III. CLAIM CONSTRUCTIONS

A. Signal point

The term **signal point** appears in all claims and means "a point on a 2-dimensional constellation having a pair of coordinates representing two components of a corresponding signal." The specification and prior art entirely support this construction.

The '627 states that the invention is an improvement to the use of "2N-dimensional channel symbols" and refers to 2N-dimensional channel symbols throughout the patent. (Abstract, 2:5-13; 3:7-8; 3:58; 4:4-24; 4:55-56; 8:19; 8:61; 9:8-9.) The "2" refers to the 2-dimensional constellation, a constant which does not change, and the variable "N" refers to the number of 2-dimensional signal points that constitute a multi-signal point symbol. (3:6-9.) Thus a **signal point** must be "a point on a 2-dimensional constellation . . ." where "2-dimensional" refers to "the I (in-phase) and Q (quadrature-phase) components of [a] signal point." (3:37-38.) Moreover, the broadest, most "general" disclosure in the '627 refers to *2*-dimensional constellations: "[i]n the general, 2N-dimensional, case each stage of the distributed trellis encoder would provide N *two-dimensional* subset identifiers to switching circuit 337 before the latter moves on to the next stage." (8:61-64; emphasis added.) The specification gives examples of N=2 ("four dimensional") and N=4 ("eight-dimensional"), but never describes using the invention with a one-dimensional signaling scheme. (8:19, 23.)

The '627 relies exclusively on signal points from 2-dimensional constellations to form its multi-signal point symbols because that is how these symbols, which are called "multi-dimensional signals" in the art, were most commonly formed in the prior art. (D061 at 1:14-22;

D087 at 2:59-68; D074 at 3:24-32.) Accordingly, the multi-dimensional signals described in the ’627 are based on the “two-dimensional signal constellation.” (3:6-8.)

The remainder of the construction, “. . . having a pair of coordinates representing two components of a corresponding signal” also comes right from the ’627. The patent describes a “signal point having coordinates” -- using the pair “(3, -5)” as an example -- which represent the “I and Q components of the signal point[].” (5:54-64; 3:37-38.)

Rembrandt’s construction of **signal point** as “[a] value that is transmitted by a modulator in one signaling interval” completely ignores the ’627’s unwavering description of signal points as points on a 2-dimensional constellation. Its construction also removes the word “point” from the claim term by ignoring the indisputable relationship between a “signal point” and the points of a “signal constellation.” (3:6-9.) Accordingly, the Court should reject Rembrandt’s construction and adopt the construction proposed above.

B. Trellis encoded channel symbol . . . comprised of a plurality of signal points

This claim term, which appears in all asserted claims, should be construed as “two or more signal points all selected using the same group of parallel input bits as expanded once by a trellis encoder.”[9] The construction is based on the patent, and permits one to distinguish between a multi-signal point symbol and series of signal points from different channel symbols. That distinction, well known in the prior art, is central to the ’627.

As described above, interleaving the constituent signal points of multi-signal point symbols is the only alleged enhancement over the ’625. (2:5-13; 1:11-14.) The ’627 provides only a brief explanation of trellis encoding multi-signal point channel symbols because this was

[9] Rembrandt proposes to construe “trellis encoded channel symbol” on its own, but this is pointless. The ’627 explains that it is an improvement over the ’625 precisely because the ’627 uses multi-signal point symbols and interleaves their constituent signal points.

well-known. What disclosure there is directly supports defendants' construction. In the case of N=2, the '627 states that a "serial-to-parallel converter" (2:61) provides "three parallel bits" (3:65), each on "separate leads" (2:67), that "are expanded into four bits . . . to identify a pair of subsets . . . ." (3:66-67) which are used (with index values) to select the pair of signal points for the 4-dimensional symbol (4:4-11.) The two signal points in this example are both, as per the proposed construction, "selected using the same group of parallel input bits" (3 bits in the example) "as expanded once by a trellis encoder" (into a total of 4 bits in the example). As explained in the Wei Paper, the Gitlin Declaration and in Section II.D.3 above, our construction is also the way one of ordinary skill in the art would understand the meaning of a trellis encoded channel symbol that contains multiple signal points at the time of the '627 filing.

Rembrandt argues that this term means "[a] set of two or more trellis encoded signal points that corresponds to a group of bits that is treated as a unit by an encoding system." This construction completely ignores the relationship between trellis encoding and the resulting multi-dimensional symbol. The '627 and the prior art explain that multi-dimensional symbols come from a group of parallel input bits expanded once by a trellis encoder, as explained above. The advantages of these multi-dimensional symbols, as described in the Wei Paper, are a direct result of the single expansion which Rembrandt ignores. (See Section II.D.3, *supra*.)

Accordingly, the Court should accept defendants' construction which is supported by the specification and the understanding of the skilled artisan as demonstrated by the Wei Paper and confirmed by the Gitlin Declaration.

C. "stream[] of trellis encoded channel symbols" and "means for generating a plurality of streams of trellis encoded channel symbols . . ."

Stream[] of trellis encoded channel symbols (all asserted claims), means "a sequence of trellis encoded channel symbols in which each symbol's signal points are adjacent."

Rembrandt agrees with the first half of this construction, but argues there is no requirement that "each symbol's signal points are adjacent." However, both the specification and the claim language require that each symbol's signal points *must* be adjacent for there to be a "stream[] of trellis encoded channel symbols." Indeed, if the signal points of each symbol in the stream are not adjacent, the basic purpose of the invention -- interleaving signal points in the stream to render them non-adjacent -- would be totally unnecessary.

The discussion in the '627 that corresponds to "stream of trellis encoded channel symbols" shows that the signal points of each symbol are adjacent. The patent describes "three interleaved streams of trellis encoded channel symbols" on lead 325 in Figure 3. (5:24-28.) Each of the three streams, the patent says, contains symbols with adjacent signal points. For example, the first stream is "X_0^α, X_1^α, X_6^α, X_7^α, X_{12}^α . . . ." (5:28-29.) X_0^α, X_1^α are the two adjacent signal points of the first 4D symbol, X_6^α, X_7^α are the two adjacent signal points of the second 4D symbol, and so forth.[10] Every symbol's signal points are adjacent in this stream.

The '627 explains that these same streams, where "the individual signal points of each channel symbol . . . are adjacent to one another," existed in the prior art. (6:52-7:6.) The patent tries to "enhance[]" the performance of systems that created these streams by adding "a signal point interleaving technique which causes the constituent signal points of the channel symbols to be non-adjacent . . . ." (2:5-13.) Rembrandt tries to render unnecessary this very signal point interleaving technique which the '627 says distinguishes it from the prior art by arguing for a construction of "**stream[] . . .**" that is broad enough to cover a stream containing symbols with signal points that are already non-adjacent. Moreover, once the stream of channel symbols has

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[10] Alternatively, even if the "stream of trellis encoded channel symbols" is the one stream of symbols as depicted on lead 325 in Figure 3, one can see the signal points of each symbol are still adjacent.

its signal points interleaved by the signal point interleaver, the patent calls it a "stream of trellis encoded signal points," not a "stream of trellis encoded channel symbols." (5:37-38.) Rembrandt's construction would eliminate this difference and conflict with the specification.

The claim language in each asserted independent claim precisely tracks defendants' explanation. It first requires "generating a plurality of streams of trellis encoded channel symbols" followed by "interleaving the signal points of said generated channel symbols *to form* said stream of trellis encoded signal points . . . [such that] the signal points of each channel symbol are *non*-adjacent . . . ." (emphasis added.) If the signal points of symbols in the stream were already non-adjacent, the "stream of trellis encoded signal points" would already have been formed, and there would be no need to interleave the signal points to make them non-adjacent. To give meaning to "interleaving," and for all the reasons stated above, the signal points of each symbol in the "stream[] of trellis encoded channel symbols" must be adjacent.

The parties agree that **means for generating a plurality of streams . . .** (claims 1(b) and 21(c)) is a means-plus-function term. *See* 35 U.S.C. § 112, ¶ 6.[11] The corresponding structure is parallel trellis encoders *with* an encoder that generates signal points. The '627 describes inputting portions of information into parallel trellis encoders, which then generate subset identifiers that are provided then to a 4D QAM encoder (an encoder that generates signal points). The 4D QAM encoder outputs on lead 325, "three interleaved streams of trellis encoded channel symbols." (4:64-5:28; *see* Section II.D.2, *supra*.) Thus, both the trellis encoders *and* the encoder generating signal points are necessary as means for generating streams of trellis encoded channel symbols.

[11] The reference to the subparts of the claims, such as in "claim 1(b)," refers to the left-hand column of the Joint Claim Construction Chart for the '627 Patent.

D. Interleaving and De-Interleaving

1. "interleaving the signal points of said generated channel symbols to form said stream of trellis encoded signal points" and "means for interleaving . . ."

Interleaving the signal points . . . , which appears in claims 9(a), 11(c) and 19(c), means "separating the adjacent signal points of each generated trellis encoded channel symbol using other signal points." As just explained above, the '627 describes and the claims require generating a plurality of streams of symbols, each keeping its signal points adjacent, after which the signal points are interleaved such that signal points from the same symbol become non-adjacent. In other words, a signal point interleaver shuffles the order of the signal points in the symbol stream so that the adjacent signal points of the same symbol are separated from each other by signal points from other symbols. Line V of Figure 5, and lead 342 in Figure 3, show the "stream of trellis encoded signal points" (5:37-38; 7:55-64) with separation between the signal points from the same symbol. (See also 9:14-44.)[12]

Rembrandt's proposed construction simply restates the claim language. Under its construction requiring merely "interleav[ing] signal points of trellis encoded channel symbols . . . ," one could erroneously be misled to believe that simply interleaving the symbols themselves satisfies this limitation, since symbols are composed of signal points. As explained above, however, the very invention of the '627 is the addition of "signal point interleaving" to symbol interleaving. (2:5-13.) Thus, Rembrandt's blurring of the distinction between interleaving symbols and interleaving signal points must be rejected.

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[12] This is evidenced by the fact that the superscripts denoting the trellis encoder for each signal point in the stream of signal points alternate: "X_0^α, X_{-1}^γ, X_2^β, X_1^α, X_4^γ, X_3^β, X_6^α, X_5^γ . . ." (5:37-39.) Signal points of the same symbol come from the same trellis encoder and have the same superscript.

The parties agree that **means for interleaving the signal points . . .** (claims 1(c) and 21(d)), is a means-plus-function term. The corresponding structure is Signal Point Interleaver 341 or 641, including delay element 3411 or 6411-6413. (5:24-41, Fig. 3, 6:46-8:2, 9:14-44, Fig. 6; *see also* Section II.D.2, *supra*; Section III.D.2, *infra* (means for "deinterleaving").) These are the only structures that interleave signal points. *See Cortland Line Co. v. Orvis Co.*, 203 F.3d 1351, 1357 (Fed. Cir. 2000) (holding that where specification "discloses only one structure corresponding to [the] means" element, the element is limited to that structure). Contrary to Rembrandt's argument, "switching circuit 337" is not part of the structure. Rather, its function is to "suppl[y]" subset identifiers to the four-dimensional QAM encoder—*not* to interleave signal points. (5:13-19.)

2. "deinterleaving the interleaved signal points . . ." and "means for deinterleaving . . ."

Deinterleaving the interleaved signal points . . . (claim 19(d) as a method step and claims 9(b) and 21(g) as the function of a means-plus-function term) should be construed as "restoring the adjacency of the separated signal points of each trellis encoded channel symbol to recover the two or more streams of trellis encoded channel symbols." In other words, this step (performed by the device that receives the signals) reverses the signal point interleaving described in Section II.D.2 above. The specification says this: "The successive received signal points are deinterleaved in signal point deinterleaver 441, which provides the *opposite* function to interleaver 341 . . . ." (5:67-6:1; emphasis added.) Our construction should be adopted.

The parties agree that **means for deinterleaving the interleaved signal points to recover said plurality of streams of trellis encoded channel symbols** (claims 9(b) and 21(g)) is a means-plus-function term that must be construed under 35 U.S.C. § 112, ¶ 6 (though they disagree on the corresponding structure.) In the patent's written description, the corresponding

structure is Signal Pont Deinterleaver 441 or 741, including delay element 4411 or 7411-7413. (5:67-6:11, Fig. 4; 9:45-51, Fig. 7.) The delay element is needed to restore the original order of the signal points in the stream.[13]

Rembrandt's contention that the structure of the deinterleaver means is the signal point deinterleaver "and/or" the switching circuit 431, "or a processor programmed to deinterleave the interleaved signal points" has no basis in the specification and is contrary to law. Nothing in the '627 states that *signal points* can be deinterleaved by a "switching circuit." The function performed by the switching circuit 431 is to "distribute[]" the signal point *pairs* to the appropriate stage of the distributed Viterbi decoder. The only structure associated with the claimed deinterleaving function in the specification is signal point deinterleaver 441 (or 741) which "deinterleave[s]" the "received signal points." (5:67-6:11.) *See Cortland*, 203 F.3d at 1357.

Rembrandt also says a "processor programmed to interleave the signal points" or to deinterleave the interleaved signal points" is a corresponding structure to the means for interleaving/deinterleaving, even though the specification never says this and provides no algorithm to do this. *Finisar Corp. v. DirecTV Group, Inc.*, 523 F.3d 1323, 1340 (Fed. Cir. 2008) ("Thus the patent must disclose, at least to the satisfaction of one of ordinary skill in the art, enough of an algorithm to provide the necessary structure under § 112, ¶ 6.").

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[13] By delaying the transmission of each even-numbered signal point on lead 456 of Fig. 4, (X_0^{α}, X_2^{β}, X_4^{γ} X_6^{α}...), while the odd-numbered point following it (X_{-1}^{γ}, X_1^{α}, X_3^{β}, X_5^{γ}...) is immediately "applied to lead 4412", the delay element restores the original order of the signal points (X_{-1}^{γ} X_0^{α} X_1^{α} X_2^{β} X_3^{β} X_4^{γ} X_5^{γ} X_6^{α}...) (the signal point order on lead 442 of Fig 4, which omits the starting X_{-1}^{γ} signal point). (5:67-6:11.)

E. A distributed Viterbi decoder

A distributed Viterbi decoder for recovering (to recover) said information from the deinterleaved signal points (claims 9(c), 19(e), and 21(h)[14]) is a "multiple stage decoder in which each stage receives all of the deinterleaved signal points of a trellis encoded channel symbol before deciding their values together using the Viterbi algorithm."

A receiver must have a "distributed Viterbi decoder . . .," described by the patent as having multiple "stages" (6:14-16; Fig. 4) in order to decode information that was encoded by a trellis encoder with multiple "stages." Furthermore, just as the trellis encoder is used to select all of the signal points by a single expansion of bits that enter the encoder at the same time (in parallel), the Viterbi decoder must receive all of a symbol's signal points before it can decide their values. This is also exactly what the specification shows, including Figure 4 which Rembrandt ignores. After deinterleaving, "all of the deinterleaved signal points of a trellis encoded channel symbol" (as in defendants' proposed construction) are applied to the appropriate "decoder stage." (6:12-20.) Figure 4 shows that this is precisely what is required. The received signal points X_0^α X_1^α (the signal points of one 4D symbol) are applied to decoder stage 419α, received signal points X_2^β X_3^β are applied to decoder stage 419β, and so forth. Only after the arrival of all of a symbol's signal points can the decoder make a decision as to which channel symbol was transmitted. (8:38-44.) Indeed, the patent warns that "[w]ithout having received all of the signal points of a channel symbol," the decoder cannot use "the accumulated path metric information" that constitutes the Viterbi decoding process in order to decode the channel symbol. (8:47-49; D0104 at 3:25-39 and D0102 (Fig. 4, "path metric" 70).)

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[14] Although dependent claims 10 and 20 only have the phrase "said distributed Viterbi decoder," not the entire phrase, they should be construed the same way as in claims 9, 19 and 21 because "said" refers to the same language in independent claims 9 and 19.

F. Receiver apparatus

A **receiver apparatus** (claims 9(a), 10, 19(a), 20) is "a device that demodulates a received signal and recovers information in the form of a serial bit stream." The '627 describes the **receiver apparatus** as the "receiver section of a modem" (2:39-40; 5:45-46; Fig. 4), explaining that it demodulates a received signal and processes it to recover information that was originally a "bit stream . . . in serial form" prior to transmission. (4:58-59; 5:45-6:45; 2:57-60; Fig. 4.) Rembrandt's proposal – "a device that receives a transmission signal" – must be rejected as inconsistent with the intrinsic evidence because it does not even require the **receiver apparatus** to process the received signal.

IV. CONCLUSION

Accordingly, Defendants request the Court to adopt Defendants' claim constructions.

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CERTIFICATE OF SERVICE

I hereby certify that on June 4, 2008, I electronically filed the foregoing with the Clerk of the Court using CM/ECF.

I further certify that I caused to be served copies of the foregoing document on June 4, 2008 upon the following in the manner indicated:

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